Express Mail Label No. EV 292457545 US
Docket No.: S1022.81236US00
Mailed April 20, 2005

In The Claims

Applicant submits below a complete listing of the current claims, with any insertions indicated by underlining and any deletions indicated by strikeouts and/or double bracketing.

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of the Claims

Please cancel claims 1-26 without prejudice or disclaimer.

Please add the following new claims, claims 27-50.

27. (New) A receiver for receiving a signal comprising a modulated carrier, with a frame having a first and second training sequences, comprising:

a frequency offset estimation unit for receiving the signal and obtaining initial information relating a carrier frequency offset from an autocorrelation signal obtained by autocorrelation of the first training sequence and for obtaining an estimate of a carrier frequency offset from an autocorrelation signal obtained by autocorrelation of the second training sequence of the received signal;

a frequency offset compensation unit for compensating the received signal with the frequency offset obtained from the frequency offset estimation unit to form a compensated received signal, and

a time reference determining unit for obtaining a timing reference for the received signal by cross-correlation of the compensated received signal with a known training sequence.

28. (New) The receiver according to claim 1, wherein the time reference determining unit is adapted to obtain a first timing reference for the received signal by autocorrelation of the

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received signal and a second timing reference for the received signal by the cross-correlation of the compensated received signal with the known training sequence.

29. (New) The receiver according to claim 1, wherein the frequency offset estimation unit comprises means for determining a phase shift in the autocorrelation signal of the received signal.

30. (New) The receiver according to claim 1, wherein receiver comprises means to detect a characteristic curve indicative of a known training sequence in the phase of the autocorrelation signal.

31. (New) The receiver according to claim 1, wherein the receiver comprises means to detect a characteristic curve indicative of a known training sequence in the amplitude of the autocorrelation signal.

32. (New) The receiver according to claim 4, wherein the characteristic curve includes peaks and/or troughs and threshold values are used to detect peaks and troughs.

33. (New) The receiver according to claim 6, wherein the threshold values are set dynamically.

34. (New) The receiver according to claim 5, wherein the characteristic curve includes peaks and/or troughs and threshold values are used to detect peaks and troughs.

35. The receiver according to claim 8, wherein the threshold values are set dynamically.

36. (New) The receiver according to claim 3, wherein the frequency offset estimation unit comprises means for determining the carrier frequency offset from the phase shift.

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37. (New) The receiver according to claim 1, wherein the receiver comprises means to determine a sign of the CFO from the phase of the autocorrelation signal from a known sequence.

38. (New) The receiver according to claim 11, wherein the receiver has means for determining a phase shift in the autocorrelation signal from a further known sequence of the received signal.

39. (New) The receiver according to claim 1, wherein the time reference determining unit comprises means to determine a characteristic curve indicative of a known training sequence in the amplitude of the autocorrelation signal.

40. (New) The receiver according to claim 1, wherein the time reference determining unit comprises means to determine a characteristic curve indicative of a known training sequence in the phase of the autocorrelation signal.

41. (New) The receiver according to claim 1, wherein the time reference determining unit comprises means to determine a characteristic curve indicative of a known training sequence in the amplitude of the cross-correlation of the compensated received sequence with the known training sequence.

42. (New) The receiver according to claim 15, wherein the characteristic curve includes peaks and/or troughs and threshold values are used to detect peaks and troughs.

43. (New) The receiver according to claim 16, wherein the threshold values are set dynamically.

44. (New) The receiver according to claim 1, wherein the receiver is adapted to output the timing reference obtained from the received signal by autocorrelation of the received

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signal if the timing reference obtained by cross-correlation of the compensated received signal with the known training sequence is not present.

45. (New) The receiver according to claim 18, wherein the receiver is adapted to otherwise output the timing reference determined by cross-correlation of the received signal.

46. (New) The receiver according to claim 18, wherein the receiver is adapted to compare the timing reference for the received signal obtained by cross-correlation of the compensated received signal with the known training sequence when present and the timing reference determined by autocorrelation of the received signal, and to output a reset signal if the two timing references differ by more than a threshold value and otherwise to output the timing reference for the received signal obtained by cross-correlation of the compensated received signal with the known training sequence.

47. (New) The receiver according to claim 1, wherein the timing reference determining unit is adapted to determine a symbol timing from a correlation peak in the cross-correlation of the received signal with the training sequence.

48. (New) The receiver according to claim 1, wherein the received signals also contain a cyclic prefix, further comprising: means for obtaining an accurate value for the carrier frequency offset by autocorrelation of the cyclic prefix with the received signal.

49. (New) An OFDM telecommunications system including a receiver according to claim 1.

50. (New) A method for processing a received signal comprising a modulated carrier having a frame with first and second training sequences, comprising:

obtaining initial information relating to a carrier frequency offset from an autocorrelation signal obtained by autocorrelation of the first training sequence;

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obtaining an estimate of a carrier frequency offset from an autocorrelation signal obtained by autocorrelation of the second training sequence of the received signal;

compensating the received signal with the obtained estimate of the frequency offset to form a compensated received signal, and

obtaining a timing reference for the received signal by cross-correlation of the compensated received signal with a known training sequence.